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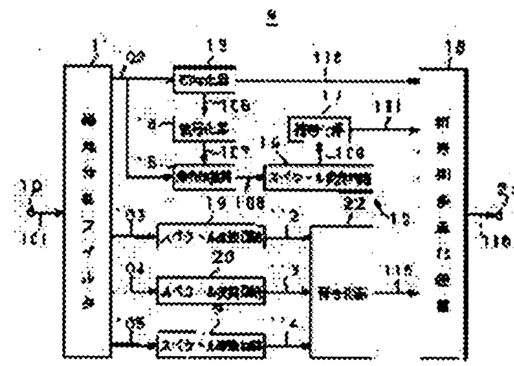
(54) ENCODING DEVICE AND METHOD, DECODING DEVICE AND METHOD AND RECORD MEDIUM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an encoding device and method and decoding device and method for realizing the bit rate scalability of only a band required for decoding by the constitution of a scale smaller than before by band-dividing input signals and realizing the bit rate scalability only for the required band.



SOLUTION: A band division filter 11 divides the entire band components of waveform signals 101 into four band components 102, 103, 104 and 105 in the order of a low frequency band and a hierarchical encoding part 12 generates code strings 110 and 111 from the band component 102. In the hierarchical encoding part 12, a first encoder 13 encodes the band component 102 and a decoder 14 decodes encoded data from the first encoder 13. A difference computing element 15 computes the difference of output signals from the decoder 14 and the band component 102, a spectrum conversion circuit 16 converts difference signals 108 from the difference computing element 15 to a frequency component and a second encoder 17 encodes a spectrum coefficient which is converted output from the spectrum conversion circuit 16.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the decryption equipment and the approach of decrypting the coding equipment which makes the input signal of digital data etc. a sign multiple-message-transmission number by high efficiency coding, an approach, and its sign multiple-message-transmission number. Moreover, this invention relates to the record medium which is recording the sign multiple-message-transmission number generated by the above-mentioned coding equipment and the approach.
[0002]
[Description of the Prior Art] Although it is in the technique and the equipments of high efficiency coding of a signal, such as an audio or voice, variously For example, band division coding (sub band coding: SBC) divided and encoded to two or more frequency bands and the signal of a time-axis are blocked per predetermined time without blocking the audio signal on a time-axis. Spectrum conversion of the signal of the time-axis for this the block of every can be carried out at the signal on a frequency shaft, and block coding or conversion coding etc. which divides into two or more signalling frequency, and is encoded for every band can be mentioned. Moreover, the technique of high efficiency coding which combined above-mentioned band division coding and above-mentioned conversion coding is also considered, and in this case, after performing band division by the above-mentioned band division coding, spectrum conversion of the signal for this every band is carried out at the signal on a frequency shaft, and it encodes for every band to this signal by which spectrum conversion was carried out.
[0003] As a filter for band division used for band division coding mentioned above here, there is a poliphase rectangular cross filter (PQF), for example, and it is [1] "Polyphase Quadrature filters-A new subband coding technique":Joseph H.Rothweiler (ICASSP 83, BOSTON). It is stated. This PQF divides an input signal into division-into-equal-parts rate bandwidth. In case the signal of each band which carried out signal division by this PQF is compounded, the so-called clinch noise is negated in adjoining bands.
[0004] Moreover, as spectrum conversion mentioned above, an input audio signal is blocked by the predetermined time basis (frame-izing), and there is a method which changes a time domain signal into a frequency-domain signal by performing discrete Fourier transform (DFT), a discrete cosine transform (DCT), a correction discrete cosine transform (MDCT), etc. for every block concerned, for example. About a correction discrete cosine transform (MDCT) [2] "Analysis/Synthesis Filter BankDesign Based on Time Domain Aliasing Cancellation": J.P.Princen, A. B.Bradley, IEEE Transactions, ASSP-34, No.5, and Oct.1986.pp1153-1161. [3] "Subbband/Transform Coding Using Filter Band Design Based on Time Domain Aliasing Cancellation": J.P.Princen, A.W.Johnson andA.B.Bradley (ICASSP 1987) It is stated.
[0005] the band where a quantizing noise will generate the signal divided for every band using such a band division filter or spectrum conversion if it quantizes -- being controllable -- acoustic-sense-properties, such as the so-called masking effect, -- using -- more -- high -- efficiency coding can be performed. moreover, the thing normalized in the absolute value of a signal component for every band before quantizing -- further -- high -- efficiency coding can also be performed.
[0006] As band division width of face in the case of quantizing each frequency component by which frequency band division was carried out here, the division method in consideration of human being's acoustic-sense property is effective. That is, generally the approach bandwidth divides with the bandwidth currently called a critical band (critical band) which becomes large, and performs coding by accommodative bit assignment (bit allocation) for every band is often performed for a higher region.
[0007] As a bit quota method, the technique currently indicated by the following reference is known well. [4]

"Adaptive Transform Coding-of-Specchi-Signals": R.Zelinskiand-P.Noll,IEEE Transactions-of-Accoustics Speechi and signal Processing, vol. ASSP-25,No.4, August 1997.[5] "The critical band coder -digitalencoding of the perceptual requirements-of-the auditory system": By the technique currently indicated by M.A.Kransner, MIT, and . (ICASSP 1980) above [4] Bit assignment is performed based on the amplitude absolute value of the signal for every band. Although a quantizing-noise spectrum becomes flat and noise energy serves as min by this method, since the masking effect is not used in acoustic sense, the feeling of a noise on an actual acoustic sense is not the optimal.
[0008] Moreover, by the technique currently indicated above [5], the required S/N is obtained for every band based on the auditory masking effectiveness, and fixed bit assignment is performed. However, by this technique, when measuring a property in a sinusoidal input, since bit assignment is fixed, there is a problem that a characteristic value does not become so good.
[0009] An assigned part of the immobilization beforehand defined for every subblock which small-divided every band and each band further in all the bits that can be used for bit assignment in order to solve these problems, While dividing into the part which performs bit allocation depending on the amplitude absolute value of the signal within each block In the split ratio, the low bit rate coding method of making the time when the spectrum distribution of a signal is smoother depend for the split ratio for fixed bit assignment on an input signal so that it may enlarge etc. is proposed.
[0010] When it considers as the approach of carrying out spectrum conversion of the wave signal on the other hand and discrete Fourier transform (DFT) and the discrete cosine transform (DCT) which were mentioned above are used, if it changes with the time amount block which consists of M samples, the independent transform coefficient of M pieces will be obtained. It encodes to this spectrum multiplier of M pieces. However, if the sign multiple-message-transmission number which performed and obtained manual coding to the spectrum multiplier of the M above-mentioned pieces is decoded, the connection distortion in the boundary of a block will occur and the noise which is not desirable will occur on an acoustic sense. In order to mitigate the distortion in this block boundary, there is the approach of overlapping the sample data of N individual, respectively and carrying out spectrum conversion with an adjoining block. However, by this approach, M translation data will be obtained from the time series sample data of an individual (M-N) on the average, the way of the spectrum data measurement size obtained by conversion rather than the original number of time series sample data increases, the number of sample data which should be encoded increases, and it is not desirable on coding effectiveness.
[0011] On the other hand, in the correction discrete cosine transform (MDCT) mentioned above, every M sample data are made to overlap with an adjoining block, respectively, spectrum conversion of the 2M piece sample data is carried out, and M independent translation data is obtained. While mitigating the distortion in a block boundary by this, since M translation data is obtained to M sample data on the average, it is possible to mitigate the distortion in a block boundary more efficiently than the case where DCT and DFT are used, and to encode. When reproducing a wave signal again from the sign train (bit stream) which quantized the translation data obtained by MDCT spectrum conversion, and was encoded After decrypting the sign train concerned and obtaining the wave signal element of 2 M piece sample for every block by performing reverse spectrum conversion according the MDCT multiplier of M pieces which reverse-quantized and was reverse-quantized further to uncorrecting cosine conversion (IMDCT) The wave signal of the M original samples can be reconfigurated by overlapping M contiguity half fields of the wave signal element of an adjoining block at a time, and adding this wave signal element.
[0012] Drawing 13 is the outline block diagram of the example of 1 configuration of the coding equipment 400 which applied the coding approach which combined the conventional band division coding approach and the conventional conversion coding approach. For example, it is the example which carries out spectrum conversion, quantizes for every band after carrying out band division of the input signal with a band division filter 402 like PQF in four bands, and is encoding. The input signal 501 from an input terminal 401 is divided into each band components 502,503,504 and 505 by the band division filter 402, spectrum conversion is carried out by the spectrum conversion circuits 403,404,405 and 406 for every band, respectively, they are collectively encoded by the spectrum multipliers 506,507,508 and 509 by quantization and the coding network 407, and, specifically, the sign train 510 is generated. The sign train 510 is multiplexed by the sign train multiplexing circuit 408, and the multiplexing sign train 511 is acquired from an output terminal 409.
[0013] Drawing 14 is the example of a configuration of the conventional decryption equipment 410 for decrypting the multiplexing sign train 511 sent from the coding equipment 400 of drawing 13 . After the sign train 512 corresponding to the multiplexing sign train 511 of drawing 15 is inputted into an input terminal 411 and passes through the sign train decomposition circuit 412, it becomes the decomposition sign train 513, and it is decrypted in a decryption and the reverse quantization circuit 413, and the decryption spectrum multipliers 514-518 for every band

are chosen. Reverse spectrum conversion of the spectrum multipliers 514-518 for every bands of these is carried out by the reverse spectrum conversion circuits 414,415,416 and 417, respectively, the wave signals 519,520,521 and 522 for every band are acquired, these wave signals 519-522 are compounded with the band composition filter 418, and the wave signal 523 of all band frequency components is sent to an output terminal 419.

[0014] If band division of the input signal is carried out with the band division filters 402, such as PQF, spectrum conversion is carried out by MDCT etc. for every band like the above-mentioned conventional example of a configuration and quantization and coding are performed, according to the configuration scale of decryption equipment 410, the wave signal of only a required band is reproducible. However, if only a reproductive required band is decrypted, reverse spectrum conversion is carried out in this case and a signal is compounded with the band composition filter (IPQF) 418, a noise will occur by return in the adjoining field of the band to reproduce and the band which is not reproduced, and distortion which is not desirable will arise on an acoustic-sense property. The approach of generating the regenerative signal by which a band was carried out by performing reverse spectrum conversion immediately after a band composition filter (IPQF) at the time of a decryption after having transposed the approach of inserting the band limit filter from which the adjoining band signal which a clinch generates is removed, and the value of the spectrum data of the adjoining band which the band which is not required just before reverse spectrum conversion (IMDCT), and a clinch noise produce to the value near 0 or 0 in order to solve this problem is proposed. Delay with a filter does not occur compared with the case where the former band limit filter is used, but the method of permuting the value of the latter spectrum data by 0 can realize a steep band limit property easily.

[0015] By the way, when the sign multiple-message-transmission number obtained by coding is decrypted and a wave signal is reproduced, according to the transmission line, the situation of a decryption machine, the configuration scale, etc., implementation of the so-called bit rate scalability in which the decryption with two or more bit rates is possible came to be desired. As the approach of implementation of bit rate scalability For example, the sign train which has a separate bit rate with two or more encoders beforehand in the case of coding is generated. Multiplex those sign trains in the case of transmission, and it returns to the sign train of each bit rate with the sign train cracking unit by the side of a decryption. Coding equipment and decryption equipment are made the approach of choosing and decrypting the sign train of a required bit rate according to an application or a situation, and a pan at a layered structure. The configuration approach that only in the part a quantization error decreases hierarchical and the SN ratio becomes high is well used, so that it is used to the sign train of the hierarchy of a high order in the case of a decryption.

[0016] As the concrete implementation approach of coding by this layered structure For example, encode with a comparatively low bit rate with the encoder corresponding to a basic layer which processes an input wave signal as fundamental information on this input wave signal, and a sign train is generated. Furthermore this generated sign train is decrypted again, a wave signal is generated, an original input wave signal and difference are taken, this differential signal is treated as escape-information on the above-mentioned input wave signal, and it encodes with the encoder corresponding to an extended layer of the layer of an one-step high order. The difference of the wave signal which decoded again the output sign train of the ** (N-1) layer encoder in this layered structure still more nearly similarly, and was reproduced, and the input signal of a ** (N-1) layer encoder is inputted into the Nth layer encoder, it encodes, and the Nth-layer output sign train is acquired. if only the sign train of the 1st layer (basic layer) is decrypted in the case of a decryption, although an SN ratio is low -- the decryption with a low bit rate -- possible -- further -- the sign train of the extended layer of the upper layer -- decrypting -- difference -- a regenerative signal with an SN ratio high hierarchical can be acquired by reproducing a wave signal and adding to the output of a basic layer.

[0017] Drawing 15 is the outline block diagram showing the example of a configuration of the coding equipment 420 which applied the conventional coding approach of realizing hierarchical bit rate scalability mentioned above. The signal 524 inputted from the input terminal 421 is first supplied to the 1st coding network 422. And the basic layer sign train 525 is outputted as a basic layer sign train through an output terminal 429 from this 1st coding network 422. to coincidence, the sign train 525 and the same sign train 526 are decrypted in the 1st decryption circuit 423 -- having -- the decrypted wave signal 527 and differential signal 528 of the Motonobu number 524 -- the 1st difference -- it is outputted from a computing element 424. This differential signal 528 is further inputted into the 2nd coding network 425, and is encoded. the sign train 529 from the 2nd coding network 425 is decrypted in the 2nd decryption circuit 426 while it turns into the 2nd layer sign train outputted from an output terminal 430 -- having -- the differential signal 532 of the wave signal 531 and wave signal 528 which were decrypted -- the 2nd difference -- it asks with a computing element 427, the differential signal 427 is further encoded by the 3rd coding network 428, and the 3rd layer sign train 533 is outputted from an output terminal 431.

[0018] On the other hand, drawing 16 is the example of a configuration of the decryption equipment 435 for decrypting the sign column group encoded with the coding equipment 420 of drawing 15 . The sign trains 541,542

and 543 inputted into input terminals 436,437 and 438 are equivalent to the sign trains 429,430 and 431 in the coding equipment 420 of drawing 15 , respectively. Here, when only the 1st layer sign train is inputted (i.e., when not inputting the sign train 542 and the sign train 543), the sign train 541 is decrypted in the 1st decryption circuit 439, the wave signal 544 is acquired, and it is inputted into an adder 442, but since a value is 0, as an output 547 of an output terminal 443, as for signals 545 and 546, the wave signal 544 is outputted as it is. Although the output wave in this case has a low SN ratio, since it can reproduce a wave signal only by decryption of the sign train of the 1st layer, the decryption with a low bit rate is possible for it. if the sign train 542 of the 2nd layer is furthermore inputted, the sign train 542 will be decrypted in the 2nd decryption circuit 440, and will be inputted into an adder 442 -- having -- the decryption wave of the 1st layer -- the output wave added to 544 -- 547 is obtained as an output. In this case, an SN ratio improves compared with the case of only the 1st layer. when inputting the sign train 543 of the 3rd layer furthermore, the wave signal 546 decrypted in the 3rd decryption circuit 441 adds with an adder 442 -- having -- an output wave -- an SN ratio of 547 improves further rather than the case where the sign train to the 2nd layer is used. thus, the so-called SN ratio whose SN ratio improves instead of a high bit rate being needed more by using it to the sign train of the upper layer more at the time of transmission -- scalable bit rate scalability coding is realizable.

[0019]

[Problem(s) to be Solved by the Invention] By the way, by hierarchical coding and the decryption approach which were explained using above-mentioned drawing 15 and drawing 16 , when band division of the input signal is carried out and it encodes with a sub-band-coding method etc. as mentioned above, deer bit rate scalability cannot be realized only to a signal with all band components. For example, when the band decrypted at the time of decode is restricted only to a low-pass component and it constitutes the small decryption equipment of a scale, the equipment which processes a part for all bands is needed to realize bit rate scalability only about the low frequency band of an input signal. Thus, since the decryption machine which restricts the band to decrypt and has the bit rate scalability which can be constituted on a scale of a desired configuration cannot be constituted, the problem that the scale of decryption equipment becomes large superfluously arises.

[0020] This invention is made in view of the above-mentioned actual condition, carries out band division of the input signal, is realizing bit rate scalability only in a required band, and aims at offer of decryption equipment and an approach in the coding equipment and the approach of realizing bit rate scalability of only a band required for a decryption with the configuration of a scale smaller than before, and a list.

[0021]

[Means for Solving the Problem] It encodes to two or more bit streams which carry out band division of the input signal, make two or more encoders a layered structure about a band [need / bit rate scalability / to be realized], and have a hierarchical SN ratio. About the other band, it encodes using a single encoder, without hierarchizing. In the case of a decryption, it decrypts with the decryption vessel of a layered structure about the band where bit rate scalability is realized, and the playback wave which compounded the signal with which the signal of the other band was decrypted, without hierarchizing, and each band was decrypted with the band composition filter (IPQF), and had a required band component is acquired.

[0022]

[Embodiment of the Invention] Hereafter, it explains, referring to a drawing about the gestalt of some operations of this invention.

[0023] First, the gestalt of the 1st operation is coding equipment which applies the coding equipment and the approach concerning this invention, and encodes signals, such as an audio or voice.

[0024] As shown in drawing 1 , this coding equipment 9 is equipped with the hierarchy coding section 12 which generates two sign trains 110,111 relevant to the signal (henceforth a band component) of one band taken out from all the bands of the wave signal 101 inputted from the input terminal 10.

[0025] The 1st encoder 13 with which this hierarchy coding section 12 encodes the one above-mentioned band component 102, The decryption machine 14 which decrypts the coded data from this 1st encoder 13, the difference which calculates the difference of the output signal from this decryption machine 14, and the above-mentioned band component 102 -- with a computing element 15 this difference -- it becomes with the 2nd encoder 17 which encodes the spectrum multiplier which is a conversion output from the spectrum conversion circuit 16 which changes the differential signal 108 from a computing element 15 into a frequency component, and this spectrum conversion circuit 16.

[0026] Here, the one above-mentioned band component 102 is extracted by the band division filter 11 which divides all the band components of the above-mentioned wave signal 101 into four band components 102,103,104 and 105 in order of a low frequency band.

[0027] Moreover, the spectrum conversion circuits 19, 20, and 21 from which coding equipment 9 changes each of the remaining band components 103,104 and 105 of the band division filter 11 into a frequency component, The 3rd encoder 22 which encodes the spectrum multiplier from these spectrum conversion circuits 19, 20, and 21, It comes to have the sign train multiplexer 18 which multiplexes the sign train from the 1st encoder 13, the coding train from the 2nd encoder 17, and the sign train from the 3rd encoder 22, and generates a multiplexing sign train.

[0028] With the decryption equipment which decrypts the sign train generally generated by coding equipment, and reproduces a wave signal, implementation of the so-called bit rate scalability in which the decryption with two or more bit rates is possible is desired according to a transmission line, the situation of equipment itself, a configuration, a scale, etc. However, with the implementation technique of the conventional bit rate scalability, the demand of the configuration of the equipment which processes a perimeter wave number band having been required, and wanting to lessen the configuration scale of decryption equipment by decrypting only some frequency bands of a sign train was not able to be met.

[0029] This coding equipment 9 realizes bit rate scalability only about the low frequency band of an input wave signal. Bit rate scalability is not realized about the signal of the other band. For this reason, when it is necessary to restrict the band which is a decryption side and is decrypted only to a low-pass component, it can respond effectively to constitute the small decryption equipment of a scale.

[0030] The lowest frequency band component is the band component 102, and as mentioned above, it is divided by the band division filter 11 from the input wave signal 101. As a band division filter 12, a poliphase rectangular cross filter (Polyphase Quadrature filters:PQF) is used, for example. This PQF divides an input signal into division-into-equal-parts rate bandwidth. In case the signal of each band which carried out signal division by this PQF is compounded, the so-called clinch noise is negated in adjoining bands.

[0031] The band component 102 divided by this PQF is sent to the 1st encoder 13. As the 1st encoder 13, what applied the coding approach that accommodative bit assignment was performed for predetermined bit allocation or every band, for every band is used. Moreover, what applied the coding approach which combined them may be used. For example, it is the encoder which applied the coding approach of having divided into the bit of the sake for the fixed bit quota pattern which was able to appoint the bit to assign beforehand for every band, and the bit for performing bit allocation depending on the magnitude of the signal of a band component, and making it depending for the split ratio on the signal related to an input signal. The output sign train 110 from this 1st encoder 13 is sent to the sign train multiplexer 18. Moreover, the same output sign train 106 as this sign train 110 is sent also to the decryption machine 14.

[0032] The decryption machine 14 decodes the above-mentioned sign train 106. What is necessary is just to use the thing of the common knowledge corresponding to an encoder as a decryption machine 14. the decrypted wave signal 107 -- difference -- it sends to a computing element 15 -- having -- difference -- the differential signal 108 with the band component 102 is acquired by the computing element 15.

[0033] A differential signal 108 is sent to the spectrum conversion circuit 16, and spectrum conversion is carried out. A correction discrete cosine transform (MDCT) is used as a spectrum conversion circuit 16. Although discrete Fourier transform (DFT) and a discrete cosine transform (DCT) can be used, since the distortion in a block boundary is mitigable in Above MDCT, it is effective in others. The spectrum multiplier 109 from this spectrum conversion circuit 16 is sent to the 2nd encoder 17.

[0034] The bit of the sake for the fixed bit quota pattern which was able to appoint the bit to assign beforehand for every band as the 2nd encoder 17, for example, It divides into the bit for performing bit allocation depending on the magnitude of the signal of a band component. It is made to depend for the split ratio on the signal related to an input signal, and what applied the coding approach which enlarges the rate of split ratio for the above-mentioned fixed bit quota pattern is used, so that the spectrum of the signal is smooth. Of course, what applied other coding approaches may be used. The output sign train 111 from this 2nd encoder 17 is sent to the sign train multiplexer 18.

[0035] On the other hand, spectrum conversion of the band components 103-105 other than band component 102 of the above-mentioned low frequency is carried out for every band by the spectrum conversion circuits 19, 20, and 21. As spectrum conversion circuits 19, 20, and 21, MDCT is used like the above-mentioned spectrum conversion circuit 16. Of course, DFT and DCT may be used. Each spectrum multiplier 112,113 and 114 from the spectrum conversion circuits 19, 20, and 21 is sent to the 3rd encoder 22.

[0036] Although the 3rd encoder 22 has applied the same coding approach as the 2nd encoder 17 of the above, it has encoded the three above-mentioned bands collectively. The output sign train 115 from this 3rd encoder 22 is sent to the sign train multiplexer 18. Here, the 1st encoder 13, the 2nd encoder 17, and the 3rd encoder 22 may be encoders of arbitration, and do not need to be an encoder based on the same coding approach.

[0037] The sign train multiplexer 18 multiplexes the output sign trains 110,111 and 115 from the 1st encoder 13, 2nd encoder 17, and 3rd encoder 22, and supplies the multiplexing sign train 116 to an output terminal 23.
[0038] An example of a format of this multiplexing sign train 116 is shown in drawing 2 . At this drawing 2 , the above-mentioned sign train 110 is made into the basic layer sign train 110 for the fundamental information on the above-mentioned band component 102. Moreover, the above-mentioned sign train 111 is made into the extended layer sign train 111 for escape-information. This basic layer sign train 110 and the extended layer sign train 11 are arranged side by side after a whole common header. Furthermore behind that, the above-mentioned sign train 115 is arranged as a high order band sign train 115.
[0039] here -- the basic layer sign train 110 -- the above -- it is the sign train which encoded the low frequency band component 102 with the 1st encoder 13, and was acquired. On the other hand, the extended layer sign train 111 is a sign train encoded and acquired, after carrying out spectrum conversion of the differential signal 108 of the wave signal 107 which once decrypted the same sign train 106 as the sign train from the 1st encoder 13, and acquired it, and the wave signal of the above-mentioned band component 102. That is, it is the differential signal of the wave signal and the band component 102 which decrypted the basic layer sign train 110, and is a signal including the quantization error which is an error at the time of coding. Although the sign train which added the extended layer sign train 111 which is this differential signal to the above-mentioned basic layer sign train 110 becomes a high bit rate from the above-mentioned basic layer sign train 110 at the time of transmission, it can make an SN ratio high as a wave signal decrypted by the decryption equipment side. On the other hand, although it will be made to a low bit rate at the time of transmission if only the extended layer sign train 110 is transmitted, as a wave signal decrypted by the decryption equipment side, an SN ratio becomes low.
[0040] Thus, in coding equipment 9, two or more bit streams in which bit rate scalability has a hierarchical SN ratio about a required band by the decryption equipment side are generable.
[0041] In addition, although the spectrum multiplier by which spectrum conversion was carried out with the 2nd encoder 17 and the 3rd encoder 22 is encoded in coding equipment 9, spectrum conversion is not necessarily needed and it is dependent on the encoder to be used.
[0042] Moreover, even if it, for example, uses the record medium which recorded the multiplexing sign train 116 of the format shown in above-mentioned drawing 2 and in which random access, such as a magneto-optic disk, is possible, in a decryption equipment side, the bit rate scalability of equipment is realizable.
[0043] Next, the gestalt of the 2nd operation is explained. The gestalt of this 2nd operation is decryption equipment which decrypts the multiplexing sign train which applied the decryption equipment and the approach concerning this invention, and was generated by the coding equipment 9 of the gestalt of implementation of the above 1st. As shown in drawing 3 , the same multiplexing sign train 301 as the multiplexing sign train 116 encoded with the coding equipment 9 of drawing 1 is inputted into this decryption equipment 29 from an input terminal 30.
[0044] This decryption equipment 29 is equipped with the hierarchy decryption section 32 which decrypts two sign trains 302 and sign trains 303 from the sign train cracking unit 31 which decomposes into three sign trains 302,303 and 304 the multiplexing sign train 301 inputted from the input terminal 31, and this sign train cracking unit 31, and generates two decryption data.
[0045] Here, two sign trains 302,303 which the sign train cracking unit 31 takes out are sign trains relevant to the above-mentioned low frequency band component 102, and are the same as the above-mentioned basic layer sign train 110 and the above-mentioned extended layer sign train 111.
[0046] The 1st decryption machine 33 with which the hierarchy coding section 32 decrypts the above-mentioned sign train 302 (basic layer sign train), The 2nd decryption machine 34 which decrypts the above-mentioned sign train 303 (extended layer sign train), The reverse spectrum conversion circuit 37 which performs reverse spectrum conversion to the spectrum multiplier 306 which is decryption data from this 2nd decryption machine 34, and generates the wave signal 310, It becomes with the adder 36 adding the wave signal 305 and the wave signal 310 from the reverse spectrum conversion circuit 310 which were acquired with the 1st decryption vessel 33.
[0047] Moreover, the 3rd decryption machine 35 with which decryption equipment 29 decrypts the above-mentioned sign train (high order band sign train) 304 from the sign train cracking unit 31, The reverse spectrum conversion circuits 38, 39, and 40 which perform reverse spectrum conversion to the spectrum multipliers 307,308 and 309 for three bands from this 3rd decryption machine 35, respectively, and generate the wave signals 312,313 and 314, It comes to have the band composition filter 41 which sends the playback wave signal 315 which compounded the wave signal 311 from an adder 311, and the wave signals 312,313 and 314 from the reverse spectrum conversion circuits 38, 39, and 40, and had a perimeter wave number band component to an output terminal 42.
[0048] The wave signal 105 which the above-mentioned sign train 302 was sent to the 1st decryption machine 33,

was decrypted, and was reproduced is sent to an adder 36. On the other hand, the above-mentioned sign train 303 is sent to the 2nd decryption machine 34. This 2nd decryption machine 34 decrypts the sign train 111 encoded with the encoder 17 of above-mentioned drawing 1 . The spectrum multiplier signal 306 decrypted with the 2nd decryption vessel 34 is changed into the wave signal 310 by the reverse spectrum conversion circuit 37, and is sent to an adder 36.

[0049] an adder 36 -- the output wave from the 1st decryption machine 33 -- 105 -- the output wave of the 2nd decryption machine 34 course -- 310 is added and the wave signal 311 is sent to the band composition filter 41. As a band composition filter 41, a reverse poliphase rectangular cross filter (IPQF) can be used. If PQF is used as a band division filter, by using Above IPQF at the time of a decryption, the so-called clinch noise is negated in adjoining bands, and generating can be pressed down.

[0050] Here, if it is made not to output the above-mentioned sign train 303 with the sign train cracking unit 31, the wave signal 310 inputted into an adder 36 will be "0", and the wave signal 305 will turn into the wave signal 311 as it is. In this case, when the above-mentioned sign train 303 is used, the quantization error of the playback wave signal 311 of this band becomes large, an SN ratio falls, but since the sign train 303 is not needed, the decode with a low bit rate is attained with the whole decryption equipment, and when the output of the sign train 303 is applied, only that part can realize hierarchical bit rate scalability that an SN ratio also improves, although the bit rate in the whole decryption equipment becomes high.

[0051] Moreover, the above-mentioned sign train 304 decomposed by the sign train cracking unit 31 is sent and decrypted by the 3rd decryption machine 35, and is divided into the spectrum multipliers 307,308 and 309 for three bands. Reverse spectrum conversion is carried out by the reverse spectrum converters 38, 39, and 40, respectively, and each signal acquires the wave signals 312, 313, and 314 for every band by them. The wave signal 311,312,314 for every obtained band is inputted into the band composition filter 41, and is compounded, and the playback wave signal 315 with a perimeter wave number band component is acquired by the output terminal 42.

[0052] Here, if it is made not to output the sign train 304 with the sign train cracking unit 31, the wave signals 312,313 and 314 are "0", only the wave signal 311 will be inputted into the band composition filter 41, and the output signal 315 only with the low-pass quadrant frequency component of all bands will be acquired. Thus, when the existence of the decomposition outputs 303 and 304 of the sign train cracking unit 31 is controlled if needed, as a combination of an output wave acquired by the output terminal 42, a quadrant band low SN ratio output, a quadrant band quantity SN ratio output, and a total band quantity SN ratio output can be realized, and bit rate scalability and frequency band scalability can be realized to coincidence.

[0053] Moreover, with this decryption equipment 29, the multiplexing sign train 116 of the format shown in above-mentioned drawing 2 may be read from a record medium, and may be decrypted. At this time, the bit rate scalability of equipment is realizable by the decryption equipment side.

[0054] Next, the gestalt of the 3rd operation is explained. The gestalt of this 3rd operation is decryption equipment which realizes bit rate scalability of only a low-pass frequency band, when decrypting the sign train encoded by the coding equipment 9 of the gestalt of implementation of the above 1st.

[0055] As shown in drawing 4 , from the decryption equipment 29 shown in above-mentioned drawing 2 , this decryption equipment 45 is omitting the 3rd [to the high bandwidth component which is not made into the object of bit rate scalability] decryption machine 35, and the reverse spectrum conversion circuits 38, 39, and 40, and makes the scale small.

[0056] The sign train 301 equivalent to the output sign train 116 of the coding equipment of drawing 1 is inputted into an input terminal 30, and it is decomposed into the sign trains 302,303 and 304 by the sign train cracking unit 31. The sign train 302 is equivalent to the basic layer sign train 110 in the coding equipment 9 of drawing 1 , similarly, the sign train 303 is equivalent to the extended layer sign train 111, and the sign train 304 is equivalent to the high order band sign train 115.

[0057] The above-mentioned sign train 302 is sent and decrypted by the 1st decryption machine 33, and serves as the wave signal 305. Moreover, the sign train 303 is sent and decrypted by the 2nd decryption machine 34, and serves as the spectrum multiplier 306, and the wave signal 310 is acquired by carrying out reverse spectrum conversion of the spectrum multiplier by the reverse spectrum conversion circuit 37. Moreover, by the adder 36, the wave signal 310 is added to the wave signal 305, and the playback wave signal 311 is acquired.

[0058] Here, if it is made for the sign train cracking unit 31 as well as the decryption equipment 29 of drawing 2 not to output the sign train 303, the wave signal 310 will be 0 and the output 305 of the 1st decryption machine 33 will be outputted to the adder output 311 as it is. On the other hand, with this decryption equipment 45, the sign train 304 is not used but makes unnecessary the 3rd decryption machine 35 in drawing 3 .

[0059] Therefore, since there is no playback decryption signal of a high-frequency component, the band composition filter 41 of drawing 3 is not needed, but the frequency component of the wave signal 311 is a quadrant band, and since it is not letting the band composition filter pass, the so-called clinch noise produces it between adjoining bands. In order to ease this, with this decryption equipment 45, the frequency component which a noise produces by return by the band limit circuit 47 is restricted, and the playback wave signal 316 is outputted to an output terminal 48.
[0060] When the sign train cracking unit 31 controls the output existence of the sign train 303 by this decryption equipment 45, the combination of a quadrant band low SN ratio output or a quadrant band quantity SN ratio output is possible as an output signal acquired by the output terminal 48.
[0061] Next, the gestalt of the 4th operation is explained. The gestalt of this 4th operation is coding equipment which applies the coding equipment and the approach of starting this invention like the above-mentioned coding equipment 9, and encodes signals, such as an audio or voice.
[0062] As shown in drawing 5 , this coding equipment 50 communalizes the 2nd encoder 17 and 3rd encoder 22 which were used for the above-mentioned coding equipment 9, and is using them as the 2nd encoder 51. That is, not using the encoder 17 shown in drawing 1 , the 2nd encoder 51 which communalized this 2nd encoder 17 is used for the hierarchy coding section 12. Since other each part can use the same thing, it attaches a same sign, and it simplifies explanation.
[0063] The signal 101 inputted into the input terminal 10 is divided into four band components by the band division filter 11. The hierarchy coding approach of realizing bit rate scalability only about some band components 102 among the signals by which band division was carried out also with this coding equipment 50 is applied.
[0064] Among the signals by which band division was carried out, while the lowest band component 102 is inputted into the 1st encoder 13, and is encoded and the sign train 110 is outputted, the same sign train 106 also as the decryption machine 14 is inputted.
[0065] the wave signal 107 which was decrypted with the decryption vessel 14 and acquired -- difference -- it is sent to a computing element 15, and spectrum conversion of the differential signal 108 with the wave signal 102 of a basis is carried out by the spectrum conversion circuit 16, and the spectrum multiplier 109 is sent to the 2nd encoder 51 of the above.
[0066] On the other hand, spectrum conversion of the outputs 103, 104, and 105 of the band of others from the band division filter 12 is carried out by the spectrum conversion circuits 19, 20, and 21 for every band, and the spectrum multipliers 112, 113, and 114 are sent to the 2nd encoder 51.
[0067] The spectrum signals 109,112,113 and 114 of each band are packed at the 2nd encoder 51, it encodes, the sign train 120 is acquired, and it is sent to the sign train multiplexer 18. In the sign train multiplexer 18, the sign train 111 and the sign train 120 are multiplexed, and the multiplexing sign train 121 is sent to an output terminal 23.
[0068] here -- the sign train 110 -- the above -- it is the sign train which encoded the low frequency band component 102 with the 1st encoder 13, and was acquired. On the other hand, the coded data which encoded the spectrum multiplier 109 which constitutes the sign train 120 is the sign train encoded and acquired, after carrying out spectrum conversion of the differential signal 108 of the wave signal 107 which once decrypted the sign train from the 1st encoder 13, and the same sign train 106, and acquired them, and the wave signal of the above-mentioned band component 102. That is, it is the differential signal of the wave signal and the band component 102 which decrypted the sign train 110, and is a signal including the quantization error which is an error at the time of coding. Although the sign train which added the sign train of this differential signal to the above-mentioned sign train 110 becomes a high bit rate from the above-mentioned sign train 110 at the time of transmission, it can make an SN ratio high as a wave signal decrypted by the decryption equipment side. On the other hand, although it will be made to a low bit rate at the time of transmission if only the sign train 110 is transmitted, as a wave signal decrypted by the decryption equipment side, an SN ratio becomes low.
[0069] Thus, in coding equipment 50, two or more bit streams in which bit rate scalability has a hierarchical SN ratio about a required band by the decryption equipment side are generable.
[0070] Furthermore, in this coding equipment 50, since the 2nd encoder 17 of the coding equipment 9 shown in above-mentioned drawing 1 and the 3rd encoder 22 are communalized and it is considering as the 2nd encoder 51, one encoder which enlarges a circuit scale can be reduced and a miniaturization can be attained. Moreover, rather than the case where it encodes separately, excessive information can be reduced by communalizing the additional information at the time of coding, header information, etc., and improvement in coding effectiveness can be aimed at.
[0071] Next, the gestalt of the 5th operation is explained. The gestalt of this 5th operation is decryption equipment which decrypts the sign train which applied the decryption equipment and the approach concerning this invention, and was encoded by the coding equipment 50 of the gestalt of implementation of the above 4th. As shown in drawing 6 ,

the same multiplexing sign train 317 as the multiplexing sign train 121 encoded with the coding equipment 50 of drawing 5 is inputted into this decryption equipment 55 from an input terminal 30.

[0072] This decryption equipment 55 communalizes the 2nd decryption machine 34 and the 3rd decryption machine 35 which were used for the decryption equipment 29 shown in above-mentioned drawing 3 , and is using them as the 2nd decryption machine 56. Since other each part can use the same thing, it attaches a same sign, and it simplifies explanation.

[0073] The sign train 302 which the sign train cracking unit 31 decomposed from the above-mentioned multiplexing sign train 317 is equivalent to the sign train 110 shown in above-mentioned drawing 5 . Moreover, the sign train 318 is equivalent to the sign train 120. In drawing 6 , the sign train 317 supplied from the input terminal 30 is decomposed into the sign train 302 and the sign train 318 by the sign train cracking unit 31.

[0074] The wave signal 305 which the sign train 302 was sent to the 1st decryption machine 33, and was decrypted, and was decrypted and was acquired is inputted into an adder 36. Moreover, the sign train 318 is sent and decrypted by the decryption machine 56 of the above 2nd, and the spectrum multipliers 319,320,321 and 322 for every four bands are obtained. Reverse spectrum conversion of these spectrum multipliers is carried out by the reverse spectrum conversion circuits 37, 38, 39, and 40 for every band, respectively, and the wave signals 323,324,325 and 326 for every band are acquired.

[0075] Among these, although the wave signals 324,325 and 326 are sent to the band composition filter 41, the signal 323 of the lowest band, i.e., the band which realizes bit rate scalability, is sent to an adder 36, is added to the output 305 of the 1st decryption machine 33, and is inputted as a band component in the band composition filter 41 with the added lowest wave signal 311. The band composition filter 41 compounds the signals 311,324,325 and 326 of each band, and sends the wave signal 327 to an output terminal 42.

[0076] Here, when the output existence of the sign train 318 is controlled by the sign train cracking unit 31, for example there is no sign train 318, the value is 0, the output 305 of the 1st decryption machine 33 is outputted as it is, and the wave signal 323 added with an adder 36 is sent for the adder output 311 to the band composition filter 41. Moreover, in this case, since a value is 0, the output 326 of the band composition filter 41 serves as a signal with the frequency component of a quadrant band, and the inputs 324,325 and 326 of other bands of the band composition filter 41 also serve as a signal with a low SN ratio compared with the case where there is a sign train 318 about the signal of the lowest band.

[0077] Thus, when the sign train cracking unit 32 controls the output existence of the sign train 318, as an output obtained by the output terminal 42, it can obtain alternatively whether you are a regenerative signal with a high SN ratio, ****** et al. in the low regenerative signal or all the bands of an SN ratio in a quadrant band.

[0078] Furthermore, with this decryption equipment 55, since the 2nd decryption machine 34 of the decryption equipment 29 shown in above-mentioned drawing 3 and the 3rd decryption machine 35 are communalized and it is considering as the 2nd decryption machine 56, one decryption machine which enlarges a circuit scale can be reduced, and a miniaturization can be measured.

[0079] Next, the gestalt of the 6th operation is explained. The gestalt of this 6th operation is decryption equipment which decrypts only low-pass area part part 2 bands of the four bands, and realizes bit scalability, when decrypting the sign train encoded by the coding equipment 40 of the gestalt of implementation of the above 4th.

[0080] As shown in drawing 7 , this decryption equipment 60 makes the scale of a circuit small by omitting the processing of two high bandwidth components which is not made into the object of bit rate scalability from the decryption equipment 55 shown in above-mentioned drawing 6 .

[0081] Specifically, the signal of the high-frequency component 321,322 is not used among the output signals for every band of the 2nd decryption machine 56. Therefore, it is good for the 2nd decryption machine 56 to decode only at a part for low-pass 2 band, and a decryption signal is acquired by only the low-pass signal. Since explanation of the part of others of this decryption equipment 60 is the same as that of the decryption equipment 55 shown in above-mentioned drawing 6 , it attaches a same sign, and it simplifies explanation.

[0082] however, the output wave of the band composition filter 41 obtained by the output terminal 65 since the inputs 325 and 326 of a high-frequency band are "0" among inputs of the band composition filter 41 -- 327 has only a frequency component for low-pass 2 band.

[0083] With this decryption equipment 60, as an output obtained by the output terminal 65, when the sign train cracking unit 31 controls the existence of the sign train 318, it can obtain alternatively whether you are a regenerative signal with a high SN ratio, ****** et al. in a quadrant band in a regenerative signal with a low SN ratio, or 1/2 band.

[0084] Furthermore, since two reverse spectrum conversion circuits 39 and 40 are made unnecessary compared with the decryption equipment 55 shown in above-mentioned drawing 6 , a circuit scale can be made small.

[0085] Next, the gestalt of the 7th operation is explained. the difference which constituted the coding equipment 50 shown in above-mentioned drawing 5 as the gestalt of this 7th operation was shown in drawing 8 -- the location of a computing element 15 and the spectrum conversion circuit 16 -- changing -- further -- difference -- it is coding equipment 70 which formed the spectrum conversion circuit 71 which carries out spectrum conversion of the above-mentioned band component 102 in front of the computing element 15.
[0086] namely, the spectrum conversion circuit 16 to which this coding equipment 70 carries out spectrum conversion of the wave signal 107 from the decryption machine 14 and the spectrum conversion circuit 71 which changes the low frequency band component 102 into a frequency component -- difference -- before a computing element 15 -- preparing -- difference -- the computing element 15 is made to calculate the difference of the frequency component 122 of the low frequency band component 102, and the frequency component 123 of the wave signal 107 Since it is the same as that of the above-mentioned coding equipment 50 about other each part, a same sign is attached and explanation is simplified.
[0087] The input signal 101 supplied from the input terminal 10 is inputted into the band division filter 11, and the wave signals 102,103,104 and 105 for every band are acquired. Also with this coding equipment 70, in order to realize bit rate scalability only about the signal 102 of the lowest band, the hierarchy coding section 12 was used and it has encoded.
[0088] The wave signal 102 of the lowest frequency band is inputted into the 1st encoder 13, and is encoded, and the encoded sign train 110 is sent also to the decryption machine 14 as a sign train 106 while it is sent to the sign train multiplexer 18.
[0089] the signal 107 acquired by decryption with the decryption vessel 14 carries out spectrum conversion by the spectrum conversion circuit 16 -- having -- the spectrum multiplier 123 -- difference -- it is sent to a computing element 15. moreover, the original wave signal 102 carries out spectrum conversion by the spectrum conversion circuit 71 -- having -- the spectrum multiplier 122 -- difference -- it is sent to a computing element 15. difference -- in a computing element 15, the differential signal 124 of the spectrum multiplier 123 and the spectrum multiplier 122 is searched for, and it sends to the 2nd encoder 51.
[0090] On the other hand, the band component of others of the band division filter 11 reaches output wave 103,104, spectrum conversion of 105 is carried out for every band by the spectrum conversion circuits 19, 20, and 21, respectively, and the spectrum multipliers 112,113 and 114 for every band are inputted into the 2nd encoder 51.
[0091] In the 2nd encoder 51, the spectrum multipliers 124,112,113 and 114 of each band are encoded collectively, and the sign train 125 is sent to the sign train multiplexer 18. In the sign train multiplexer 18, the sign train 111 and the sign train 125 are multiplexed, and the multiplexing sign train 126 is sent to an output terminal 72.
[0092] An example of a format of the multiplexing sign train 126 outputted from this sign train multiplexer 18 is shown in drawing 9 . The basic layer sign train 110 and the extended layer sign train 125 are arranged side by side after a whole common header.
[0093] here -- the sign train 111 -- the above -- it is the sign train which encoded the low frequency band component 102 with the 1st encoder 13, and was acquired. on the other hand, the difference which constitutes the sign train 125 -- the coded data of the spectrum multiplier 124 from a computing element 15 is the sign train which encoded the differential signal of the spectrum multiplier 123 after carrying out spectrum conversion of the wave signal 107 which once decrypted the sign train from the 1st encoder 13, and the same sign train 106, and acquired them, and the spectrum multiplier 122 after carrying out spectrum conversion of the wave signal of the above-mentioned band component 102. That is, it is the frequency component of a signal including the quantization error which is the differential signal of the frequency component of the wave signal which decrypted the sign train 110, and the frequency component of the wave signal of the band component 102, and is an error at the time of coding. Although the sign train which added the sign train of this differential signal to the above-mentioned sign train 110 becomes a high bit rate from the time of transmitting only the above-mentioned sign train 110, it can make an SN ratio high as a wave signal decrypted by the decryption equipment side. On the other hand, although it will be made to a low bit rate at the time of transmission if only the sign train 110 is transmitted, as a wave signal decrypted by the decryption equipment side, an SN ratio becomes low.
[0094] Thus, in coding equipment 70, two or more bit streams in which bit rate scalability has a hierarchical SN ratio about a required band by the decryption equipment side are generable.
[0095] Moreover, in this coding equipment 70, since the 2nd encoder 17 of the coding equipment 10 shown in above-mentioned drawing 1 and the 3rd encoder 22 are communalized and it is considering as the 2nd encoder 51, one encoder which enlarges a circuit scale like the coding equipment 50 shown in above-mentioned drawing 5 can be reduced, and a miniaturization can be measured. Especially this coding equipment 70 has a good property, when low-

pass is a sound signal.
[0096] Moreover, even if it, for example, uses the record medium which recorded the multiplexing sign train 126 of the format shown in above-mentioned drawing 9 and in which random access, such as a magneto-optic disk, is possible, in a decryption equipment side, the bit rate scalability of equipment is realizable.
[0097] Next, the gestalt of the 8th operation is explained. The gestalt of this 8th operation is decryption equipment which decrypts only low-pass area part part 2 bands of the four bands, and realizes bit scalability to low-pass 1 band, when decrypting the sign train encoded by the coding equipment 70 of the gestalt of implementation of the above 7th.

[0098] In addition, as shown in drawing 10 , since this decryption equipment 80 is considering even the sign train cracking unit 31 of the decryption equipment 60 shown in above-mentioned drawing 7 , the 1st decryption machine 33, and the 2nd decryption machine 56 as the same configuration, it gives the same sign to these each part, and simplifies explanation. Moreover, the same multiplexing sign train 328 as the multiplexing sign train 126 encoded with the coding equipment 70 of drawing 8 is inputted into this decryption equipment 80 from an input terminal 30.
[0099] The above-mentioned multiplexing sign train 328 is decomposed into the sign train 302 and the sign train 330 by the sign train cracking unit 31. The sign train 302 is equivalent to the sign train 110 of the coding equipment 70 shown by above-mentioned drawing 8 , and the sign train 330 is equivalent to the sign train 125 similarly. The sign train 302 is inputted into the 1st decryption machine 33, the decryption signal 305 is acquired, further, spectrum conversion of this decryption signal 305 is carried out by the spectrum conversion circuit 81, and that spectrum multiplier 329 is sent to an adder 82.
[0100] On the other hand, the sign train 330 is decrypted with the 2nd decryption vessel 56, and the decryption spectrum multiplier 331,332 for every band is obtained. Here, among the outputs of the 2nd decryption machine 56, since the high region outputs 333 and 334 do not use it with the gestalt of this operation, the 2nd decryption machine 56 should perform only the decryption for low-pass 2 band. The decryption spectrum 331 of the lowest band is sent to an adder 82, and it is added to the spectrum multiplier 329, and reverse spectrum conversion of **** and its applied spectrum multiplier 335 is carried out by the reverse spectrum conversion circuit 83, the wave signal 336 is acquired, and this wave signal is inputted as a minimum band signal of the band composition filter 85. Moreover, reverse spectrum conversion of the decrypted spectrum multiplier 332 is carried out by the reverse spectrum conversion circuit 84, and the wave signal 337 which is the output is inputted into the band composition filter 85 as 2nd band component.
[0101] the band composition filter 85 -- the wave signal 336 and the wave signal 337 -- compounding -- an output wave -- 340 is obtained and it sends to an output terminal 90. The input signals 338 and 339 of the high-frequency component of this band composition filter 85 are 0. for this reason, an output wave -- 340 becomes a signal with the frequency component of 1/2 band.
[0102] When the sign train cracking unit 31 controls the existence of the output of the sign train 330, it can obtain alternatively whether you are the high playback wave signal of an SN ratio, ****** et al. as an output obtained by the output terminal 90 in a quadrant band in the low playback wave signal of an SN ratio, or 1/2 band.
[0103] With this decryption equipment 80, since equipment required for processing of high region 2 band is omitted, a configuration scale can be made smaller than the decryption equipment which decrypts about all bands. Although this example shows the example of a configuration of low-pass 2 band, the configuration and all the band configurations of only low-pass 1 band are also possible by the same configuration approach if needed.
[0104] Next, the gestalt of the 9th operation is explained. The gestalt of this 9th operation is also coding equipment which applies the coding equipment and the approach concerning this invention, and encodes signals, such as an audio or voice.
[0105] As shown in drawing 11 , this coding equipment 95 The band division filter 97 which divides into four band components 138,139,140 and 141 the wave signal 131 inputted from the input terminal 96 in order of a low frequency band, The low pass filter 98 which passes the low frequency component 138 of the wave signal 131, and the same low band component, The down sampling circuit 99 which performs infanticide processing in order to make the sampling frequency of the low frequency component from this low pass filter 98 into the same sampling frequency as the sampling frequency of the above-mentioned low band component, The 1st encoder 100 which encodes the low frequency component through this down sampling circuit 99, The decryption machine 101 which decrypts the coded data from this 1st encoder 100, The spectrum conversion circuit 102 which changes the decryption data from this decryption machine 101 into a frequency component, The spectrum conversion circuits 104,105,106 and 107 which change four band components 138,139,140 and 141 from the above-mentioned band division filter 97 into a frequency component, respectively, the difference which calculates the differential signal 143 of the spectrum

multiplier 137 from the above-mentioned spectrum conversion circuit 102, and the spectrum multiplier 142 from the spectrum conversion circuit 104 -- with a computing element 108 this difference -- the difference from a computing element 108 -- with the 2nd encoder 109 which summarizes the spectrum multiplier 143 and the spectrum multipliers 144,145 and 146 from the spectrum conversion circuits 105,106 and 107, and is encoded It comes to have the sign train multiplexer 103 which multiplexes the coded data 134 from the 1st encoder 100, and the coding train 147 from the 2nd encoder 109, and generates the multiplexing sign train 148. and a low pass filter 98, the down sampling circuit 99, the 1st encoder 100, the decryption machine 101, the spectrum conversion circuit 102, the spectrum conversion circuit 104, and difference -- a computing element 108 and the 2nd encoder 109 constitute the hierarchy coding section 111. This coding equipment 95 is also the modification of the coding equipment 70 shown in above-mentioned drawing 8 .

[0106] While it is inputted into the band division filter 97 and band division is carried out, an input signal 131 passes through a low pass filter 98 and the down sampling circuit 99, and is changed into the signal 133 with the same band and same sampling frequency as the first band divided with the band division filter 97.

[0107] It encodes with the 1st encoder 100 and this signal 133 acquires the sign train 134. Moreover, after the same sign train 135 is decrypted with the decryption vessel 101 and made into coded data 136, spectrum conversion is carried out by the spectrum conversion circuit 102, and it serves as the spectrum multiplier 137 by it. this spectrum multiplier 137 -- difference -- a computing element 108 is supplied.

[0108] this difference -- the spectrum multiplier 142 obtained by supplying the band component 138 obtained with the band division filter 97 to the spectrum conversion circuit 104 is also supplied to a computing element 108. and difference -- the differential signal 143 calculated with the computing element 108 is supplied to the 2nd encoder 109.

[0109] Spectrum conversion is carried out by the spectrum conversion circuits 105,106 and 107, respectively, and the remaining band components 139,140 and 141 divided with the band division filter 97 serve as the spectrum multipliers 144,145 and 146, and are supplied to the 2nd encoder 109.

[0110] The 2nd encoder 109 encodes the above-mentioned spectrum multipliers 143,144,145 and 146, and generates the sign train 147.

[0111] And the sign train multiplexer 103 multiplexes the coded data from the 1st encoder 100, and the sign train 147 from the 2nd encoder 109, generates a multiplexing sign train, and sends it to an output terminal 110.

[0112] That this coding equipment 95 makes it differ from the coding equipment 70 of above-mentioned drawing 8 is the point that the first encoder did not encode the signal which passed the band division filter, but was obtained with the low band component passage filter and that it is a low frequency component.

[0113] the above from which the sign train 134 was acquired by the low pass filter 98 and the down sampling circuit 99 here -- it is the sign train which encoded the low frequency band component 133 with the 1st encoder 100, and was acquired. on the other hand, the difference which constitutes the sign train 147 -- the coded data of the spectrum multiplier 143 from a computing element 108 The spectrum multiplier 137 after carrying out spectrum conversion of the wave signal 136 which once decrypted the sign train 134 from the 1st encoder 100, and the same sign train 135, and acquired them, It is the sign train which encoded the differential signal with the spectrum multiplier 142 after carrying out spectrum conversion of the wave signal of the band component 138 obtained with the above-mentioned band division filter 97. That is, it is the frequency component of a signal including the quantization error which is the differential signal of the frequency component of the wave signal which decrypted the sign train 134, and the frequency component of the wave signal of the band component 138, and is an error at the time of coding. Although the sign train which added the sign train of this differential signal to the above-mentioned sign train 134 becomes a high bit rate from the time of transmitting only the above-mentioned sign train 134, it can make an SN ratio high as a wave signal decrypted by the decryption equipment side. On the other hand, although it will be made to a low bit rate at the time of transmission if only the sign train 134 is transmitted, as a wave signal decrypted by the decryption equipment side, an SN ratio becomes low.

[0114] Thus, in coding equipment 95, two or more bit streams in which bit rate scalability has a hierarchical SN ratio about a required band by the decryption equipment side are generable.

[0115] In this coding equipment 95, since the 2nd encoder 17 of the coding equipment 9 shown in above-mentioned drawing 1 and the 3rd encoder 22 are communalized and it is considering as the 2nd encoder 109, one encoder which enlarges a circuit scale like coding equipment 70 can be reduced, and a miniaturization can be attained. Moreover, improvement in coding effectiveness can be aimed at by communalizing additional information with header information more nearly excessive than the case where it encodes separately etc.

[0116] in addition -- this coding equipment 95 -- the 2nd encoder 109 of the above -- difference -- it cannot be

overemphasized that you may divide into the encoder which encodes the differential signal 143 from a computing element 108, and the encoder which encodes the spectrum multipliers 144,145 and 146 from the spectrum conversion circuits 105,106 and 107.

[0117] Next, the gestalt of the 10th operation is explained. The gestalt of this 10th operation is decryption equipment which decrypts the sign train encoded by the coding equipment 95 of the gestalt of implementation of the above 9th. As shown in drawing 12 , the same multiplexing sign train 345 as the multiplexing sign train 148 encoded with the coding equipment 95 of drawing 11 is inputted into this decryption equipment 115 from an input terminal 116.

[0118] The sign train cracking unit 117 which decomposes into two sign trains 346 and 350 the multiplexing sign train 345 as which this decryption equipment 115 was inputted from the input terminal 116, The 1st decryption machine 118 which decrypts the sign train 346, and the 2nd decryption machine 122 which decrypts the sign train 350, The spectrum conversion circuit 119 which carries out spectrum conversion of the decryption data from the 1st decryption machine 118, The adder 120 which adds the spectrum multiplier 351 from the 2nd decryption machine 122 to a spectrum multiplier from this spectrum conversion circuit 119, The reverse spectrum conversion circuit 121 which performs reverse spectrum conversion to an addition output (spectrum multiplier) from this adder 120, The reverse spectrum conversion circuits 123,124 and 125 which perform reverse spectrum conversion to the spectrum multipliers 353,354 and 355 from the decryption machine 122, respectively, It comes to have the band composition filter 126 which compounds the band of the wave signals 356,357,358 and 359 from these reverse spectrum conversion circuits 121,123,124 and 125. Here, the 1st decryption machine 118, the spectrum conversion circuit 119, an adder 120, the reverse spectrum conversion circuit 121, and the 2nd decryption machine 122 constitute the hierarchy decryption section 130.

[0119] The sign train 346 which the sign train cracking unit 117 decomposed from the above-mentioned multiplexing sign train 345 is equivalent to the sign train 134 shown in above-mentioned drawing 11 . Moreover, the sign train 350 is equivalent to the sign train 147.

[0120] The wave signal 347 which the above-mentioned sign train 346 was sent to the 1st decryption machine 118, was decrypted, and was reproduced is sent to an output terminal 127. Moreover, the wave signal 347 and the same wave signal 348 are sent to the spectrum conversion circuit 119 from the decryption machine 118.

[0121] The spectrum multiplier 349 from the spectrum conversion circuit 119 is sent to an adder 120. The spectrum multiplier 351 decrypted with the 2nd decryption vessel 122 is also sent to this adder 120. difference [in / in this spectrum multiplier 351 / above-mentioned drawing 11] -- it corresponds to the spectrum multiplier 143 which is a differential signal from a computing element 108.

[0122] Reverse spectrum conversion of the sum 352 of the spectrum multiplier used as the addition output of an adder 120 is carried out by the reverse spectrum conversion circuit 121, and the wave signal 356 is sent to the band composition filter 356.

[0123] Moreover, the spectrum multipliers 353,354 and 355 from the decryption machine 122 are spectrum multipliers corresponding to the spectrum multipliers 144, 145, and 146 of above-mentioned drawing 9 , and are changed into the wave signals 357, 358, and 359 by the reverse spectrum conversion circuits 123, 124, and 125.

[0124] And the band composition filter 126 compounds the above-mentioned wave signals 356, 357, 358, and 359, and sends the synthetic wave signal 360 to an output terminal 128.

[0125] here -- a sign -- a train -- a cracking unit -- 117 -- the above -- a sign -- a train -- 350 -- an output -- existence -- controlling -- if -- for example -- a sign -- a train -- 350 -- there is nothing -- a case -- an adder -- 120 -- adding -- having -- a spectrum -- a multiplier -- 351 -- " -- zero -- " -- it is -- a spectrum -- a multiplier -- 349 -- as it is -- reverse -- a spectrum -- a conversion circuit -- 121 -- supplying -- having -- a wave -- a signal -- 356 -- a band -- composition -- a filter -- 126 -- sending -- having . Moreover, in this case, since the wave signal of other bands to the band composition filter 126 is also 0, the output 360 of the band composition filter 126 serves as a signal with the frequency component of a quadrant band, and serves as a signal with a low SN ratio compared with the case where there is a sign train 350 about the signal of the lowest band.

[0126] Thus, when the sign train cracking unit 117 controls the existence of the output of the sign train 350, as an output obtained by the output terminal 128, it can obtain with a regenerative signal with a low SN ratio in a quadrant band, and can obtain alternatively whether they are a regenerative signal with a high SN ratio, and ******** in the high regenerative signal or all the bands of an SN ratio in a quadrant band, and transmission bit rate scalability and frequency band scalability can be realized to coincidence. Moreover, the wave signal 347 from the decryption machine 118 is also always drawn from an output terminal 127.

[0127]

[Effect of the Invention] Also when the configuration scale of decryption equipment is made small by decrypting only

the signal of a band required in the case of a decryption when it constitutes the equipment which realizes bit rate scalability according to this invention, it becomes possible to realize bit rate scalability about the band decrypted. By this, when a decryption machine decrypts only some bands, the small bit rate scalability decryption equipment of a scale more efficient than before can be constituted.

[Translation done.]